Slideshow
FULL DETAILS AND TRANSCRIPT

Designing Hovercrafts: Anchoring Instruction in Real-life Problems

Lodi Middle School, Wisconsin • March 2008

Topic: How to Organize Your Teaching
Practice: Abstract-Concrete Connections

Highlights

- Hendrickson's hovercraft activity demonstrates how important math concepts can be embedded in motivating, real-life problem solving
- With instruction anchored in real problems students have the opportunity to understand the applications of the mathematical tools, skills, and strategies they are learning.

About the Site

Lodi Middle School
Lodi, WI

Demographics
97% White
1% Asian
1% Hispanic
1% Black

13% Special Education/Disabled
12% Free or Reduced-Price Lunch

The hovercraft design project, a culminating activity in the Fraction of the Cost curricular unit, provides opportunities for students to:

- practice important math skills like measuring, producing, and reading schematic drawings; drawing to scale; visualizing three dimensions; and finding angles—all embedded in real-life problem solving,
- see and understand the applications of the mathematical tools, skills, and strategies they are learning, and
- experience motivating, project-based learning focused on solving mathematics problems.

Full Transcript

Presentation Title: Designing Hovercrafts: Anchoring Instruction in Real-life Problems

Lodi Middle School, Lodi, WI

Students in Lyle Hendrickson's seventh-grade math class apply their understanding of abstract concepts in concrete problem situations by designing, modeling, and building hovercrafts. This design challenge fosters skills in interpreting 2 and 3-D shapes, drawing schematic plans to scale, and working with units of measure.

Slide #1: Problems in Context

In the *Hovercraft Challenge*, students work in engineering teams to design and construct a "rollover cage" out of PVC pipe for a hovercraft they will ride the final day of the project. The concrete, 3-D model helps students visualize, compare, and transform geometric objects. These are important curricular goals in middle grades geometry.

Slide #2: Design Stage

Students first draw top and side views of their rollover cages to scale, on graph paper, drawing on skills of measurement, fractions, and converting feet to inches. Because pipe connectors only come in 45- and 90-degree angles, students develop an understanding of how geometric shapes affects dimensions of their cage. Teams must figure the cost of materials to build their cage and stay within a predetermined budget.

Slide #3: Modeling Stage

After each team's scale drawing is approved, students build a scale model of their cage out of plastic straws. The purpose of the model is to give students additional opportunities to visualize the relationships between two- and three-dimensional shapes. Students can also check and compare their materials list to the one they made during the design stage.

Slide #4: Geometrical Transformations

Geometrical transformations such as flips, turns, slides and scaling are particularly difficult concepts for students to grasp in the abstract or without concrete models. Building straw models helps students visualize what the full-scale cages would look like and compare them to the 2-D, paper drawings.

Slide #5: Construction Stage

Once they have created their design plans students construct their hovercraft cages. They use their knowledge of ratios to determine the actual lengths of the pipe needed for the full-size hovercraft. Another part of the challenge for students is deciding how to use combinations and cut of PVC pipe lengths in the most economical way. Building their hovercraft is the first test as to whether their plan makes sense.

Slide #6: Design Work

When students have prepared the materials according to plan and assembled the parts, they fit the cage on the hovercraft platform. Students get immediate feedback as to how well they planned and constructed the cage. Students can see whether their work has produced a workable hovercraft of if slight adjustments have to be made.

Slide #7: The Big Finish

This seven-day unit culminates in a day of hovercraft racing in the classroom, school hallways, or gymnasium. The product of all the students' hard work and good thinking is visible in the vehicle they built. Working within the constraints of this design challenge teaches students that thoughtful planning, precise measurement, and accurate computation result in successful outcomes.